

科目：分析化學(2005)

校系所組：中大化學學系 清大化學系 交大應用化學系甲組



Multiple choices (only one correct answer), 4% each

答案請填寫於電腦卡

1. The wavelength of the fundamental N—H stretching vibration is about 1.4 μm . What is the approximate wavenumber (cm^{-1}) of the second overtone peak for the N—H stretch? (A) 36 (B) 71 (C) 3550 (D) 7140 (E) none of the above.
2. Toluene is analyzed by mass spectrometry. Which ionization method is best suited for this analyte? (A) electrospray ionization (ESI) (B) electron impact ionization (EI) (C) fast atom bombardment (FAB) (D) matrix-assisted laser desorption/ionization (MALDI) (E) secondary ion mass spectrometry (SIMS).
3. Which of the following is not a mass-sensitive detector? (A) thermal conductivity (B) atomic emission (C) thermionic (D) flame ionization (E) none of the above.
4. Which of the following is the most widely used of all quantitative analysis techniques in chemical and clinical laboratories? (A) UV-visible absorption spectrometry (B) mass spectrometry (C) luminescence spectrometry (D) infrared spectrometry (E) none of the above.
5. Which of the following is not a chromophore? (A) alkyne (B) alkene (C) alkane (D) nitro (E) nitrate.
6. Iodobenzene has no fluorescence feature. The main reason is that (A) heavy atom effect (B) predissociation (C) structural rigidity (D) poor water solubility (E) temperature effect has resulted in this consequence.
7. Luminol is used by crime scene investigators to locate traces of blood, even if it has been cleaned or removed. It is because that (A) amino acids (B) potassium ions (C) iron ions (D) sodium ions (E) water in the blood can catalyze chemiluminescence of luminol.
8. What is the number of vibration normal modes of water? (A) 6 (B) 5 (C) 4 (D) 3 (E) 2.
9. Calculate the equilibrium concentration of methyl ammonia in a solution that has a molar analytical CH_3NH_2 concentration of 0.120 M and a pH of 12.
 $K_a = 2.3 \times 10^{-11}$ (A) 0.115 M (B) 0.120 M (C) 0.125 M (D) 0.130 M (E) 0.135 M.

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10. A 1 g sample of canned tuna was analyzed by the Kjeldahl method; 20 mL of HCl (0.1 M) were required to titrate the liberated ammonia. Calculate the percentage of nitrogen in the sample. (A) 2.2% (B) 2.4 % (C) 2.6 % (D) 2.8 % (E) none of the above.
11. What type of organic compounds is better analyzed by EI-MS, rather than by MALDI-MS? (A) saccharide (B) alkenes (C) peptides (D) nucleotides (E) none of the above.
12. Which of the following is most closely related to the term "reproducibility" in a chemical analysis? (A) linear dynamic range (B) sensitivity (C) accuracy (D) detection limit (E) precision.
13. Organic acids, $C_nH_{2n+1}COOH$, would not be separated using (A) normal-phase liquid chromatography (B) ion-pair liquid chromatography (C) size exclusion chromatography (D) ion-exchange chromatography (E) none of the above.
14. Which of the following operations on the stationary phase would probably reduce the adsorption phenomenon for polar analytes on the surface of column packing in GC or HPLC? (A) end-capping (B) sparging (C) cross-linking (D) pressure-releasing (E) temperature-annealing.
15. Which of the following detectors has not been used in gas chromatography? (A) mass spectrometer (B) atomic emission (C) electron capture (D) FT-IR (E) UV/Vis absorbance.
16. Which of the following expressions is not related to inductively coupled plasma emission spectrometry? (A) many of the most sensitive analyte lines from ions (B) more hydroxide species interference than other emission techniques (C) less ionization interference than other emission techniques (D) less interelement interference than other emission techniques (E) spectral interferences from line overlap often present.
17. Which of the following chromatographic techniques would be best for determining molecular-weight distribution of a polymer product? (A) gel permeation chromatography (B) reverse-phase chromatography (C) normal-phase chromatography (D) ion-exchange chromatography (E) adsorption chromatography.

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18. Which of the following sources gives lowest spectral line broadening in atomic spectrometry? (A) uncertainty effect (B) Doppler effect (C) pressure effect (D) collision effect (E) temperature effect.
19. Which gas would you choose in gas chromatography to achieve a better sensitivity if a thermal conductivity detector is applied? (A) N_2 (B) Ne (C) H_2 (D) CO_2 (E) CH_4 .
20. In a hydrogen/oxygen flame, an atomic absorption peak for Ca was found to decrease in the presence of large concentrations of sulfate ion. This sulfate interference could be suppressed by adding excessive Sr or La. The chemical added to the sample in this case is called a (A) internal standard (B) protective agent (C) ionization suppressor (D) releasing agent (E) dissociation agent.
21. Hollow cathode lamps are usually used as sources in atomic absorption spectrometry mainly due to their: (A) accurate emission wavelength (B) high intensity radiation (C) narrow emission bandwidth (D) focused beam size (E) low ion line radiation.
22. A pH meter measures (A) cathodic current under an applied voltage (B) anodic current under an applied voltage (C) half-wave potential during linear scanning (D) junction potential across a membrane (E) half-cell potential against a standard buffer.
23. Which of the following terms is not associated with background correction techniques in atomic absorption spectroscopy? (A) two-line correction (B) Zeeman effect correction (C) continuum-source correction (D) ionization-equilibrium correction (E) source self-reversal correction.
24. Which of the following techniques would be most suitable for determining ppb concentration level of Pb in human blood sample, if less than 0.1 mL blood to be drawn? (A) inductively-coupled plasma atomic emission (B) flame atomic absorption (C) electrothermal atomic absorption (D) inductively-coupled plasma/mass spectrometry (E) direct-current plasma atomic emission.
25. Why is pulse polarography more sensitive than non-pulse polarography? (A) because of its hydrodynamic nature (B) because of the cyclic process (C) because of the pre-concentration phenomenon (D) because of the low non-faradaic current (E) because of the extremely rapid charge-transfer.